10/Request for Rec 2837
J. Steele
4/24/01

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Martin E. LEE

Application No.: 09/449,762

Filed: November 26, 1999

Group Art Unit: 2837

Examiner: B. Ro

Docket No.: 102306.08

For: POSITIONING DEVICE HAVING DYNAMICALLY ISOLATED FRAME, AND LITHOGRAPHIC DEVICE PROVIDED WITH SUCH A POSITIONING DEVICE

REQUEST FOR RECONSIDERATION

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

In reply to the Office Action dated January 19, 2001, Applicant requests reconsideration of this application. Claims 1-6 are pending.

Applicant thanks Examiner Ro for the courtesies extended to Applicant's representative at the April 12 personal interview. The substance of the interview is incorporated in the following remarks.

Applicant notes with appreciation the allowance of claims 4-6, and the indication that claim 3 contains allowable subject matter. Applicant notes that 37 C.F.R. 1.606 does not require that all claims be allowed prior to declaration of the interference. In any event, Applicant respectfully submits that all pending claims are in condition for allowance for at least the reasons set forth below.

Claims 1 and 2 stand rejected under 35 U.S.C. §102(b) over U.S. Patent No. 4,891,526 to Reeds. This rejection is respectfully traversed.

The Office Action asserts that the flexible mounts 26 of Reeds dynamically isolate platform 20 from base 28. Applicant respectfully submits that the Office Action is incorrect, and that the rejection of the claims should be withdrawn.

Reeds discloses an X-Y-θ-Z positioning stage in which the structure for moving a wafer in the X and Y directions is mounted on the structure for rotating in the θ direction. The entire X-Y-θ stage system also can be moved vertically in the Z direction or tilted with respect to the X-Y plane by controlling one or more of three actuators that are respectively coupled to three flexible mounts 26a-26c.

The basic structure is illustrated in Fig. 1 and described at, for example, col. 4, lines 21-48 of Reeds. An X-Y stage plate 12 is mounted on X translation linear bearings 14a, 14b. Those bearings, in turn are mounted on an intermediate plate 16, which rides on Y translation linear bearings 18a, 18b. Each of the bearings 14a, 14b, 18a, 18b consists of a line of balls positioned between two V-shaped notches in which the ball surfaces roll. The Y-translation bearings are, in turn, mounted on a θ rotation stage platform 20, upon which an interferometer 34 also is mounted. Platform 20 is mounted on the end of a rotor drum 21, which is set inside rotation bearings 22, which in turn are set inside of a stator 24. Bearings 22 also consist of ball bearings mounted in channels.

As indicated in col. 4, lines 42-45, stator 24 is secured to a base 28 by three vertically adjustable flexible mounts 26a, 26b, 26c. As described at col. 8, line 58 - col. 9, line 15, each flexible mount 26a-26c has the structure illustrated in Fig. 6, including a flexible circular metal diaphragm 124a having a center hub 126a drilled and tapped to receive a mounting screw 128a, which attaches the flexible mount to stator 24. As shown in Fig. 6, the lower portion of the center hub 126a rests upon a cam 132a, which is rotated by a motor 136a in order to adjust the height of the mount 26a. See, for example, col. 8, line 67 - col. 9, line 2.

The mounts 26 are very stiff (see, for example, col. 9, lines 4-8, which states that they undergo a deflection of 0.010 inches for an applied force of 500 pounds; presumably there would be an even smaller deflection for a force applied in the horizontal direction since the mounts are thicker in the horizontal direction). The height and tilt of the stage apparatus can be controlled by controlling the motors 136a-136c associated with the respective mounts 26a-26c. See col. 9, lines 11-15.

Additionally, as illustrated in Fig. 7, the motors for causing movement in the X, Y and θ directions are mounted to respective flanges 38, which in turn are mounted to base 28.

Flexible mounts 26a-26c do not dynamically isolate platform 20 from base 28. The flexible mounts 26a-26c are well known metal diaphragms that are designed to be stiff in the horizontal direction (in Fig. 6) while allowing for movement in the vertical direction. That is, the mounts allow the central hub 126 to move vertically with respect to the outer annular portion of the mounts (the annular portion is attached to the base 28 by screws 130a and 131a in Fig. 6), while preventing the central hub 126 from moving horizontally with respect to the outer annular portion of the mounts. The purpose of the mounts is to allow the stator 24 (and platform 20 mounted on the stator as shown in Fig. 6) to move vertically relative to motor 136 (and the base 28 to which the motor is mounted) without allowing for horizontal movement between those elements. See, for example, col. 2, lines 45-46 and col. 9, lines 16-21, where Reeds states "the center of rotation for the rotating stage does not move relative to the beam axis." This confirms that no lateral displacement is permitted between the base 28 and the platform 20. Since these elements move together, they cannot be dynamically isolated from each other.

Thus, any horizontal forces (including horizontal reaction forces) applied to the base 28 will be transmitted to the platform 20 through the mounts 26. In addition, because the

upper portion of center hub 126a is fixedly attached to stator 24, while the lower surface of center hub 126a rests directly on cam 132a (see Fig. 6), any vertical forces (vertical with reference to Fig. 6) applied to base 28 (to which the motor 136a that drives cam 132a is mounted) will be directly transmitted through center hub 126a to stator 24. Accordingly, mounts 26 do not dynamically isolate base 28 from platform 20.

The fact that mounts 26a-26c do not dynamically isolate platform 20 from base 28 is further confirmed by col. 9, lines 21-26, where Reeds states:

> It should be noted also that the support points for the vertically adjustable flexible mounts are located as nearly as possible in the planes of the X and Y drives, in order that reaction forces resulting from X and Y accelerations will have minimal impact on Z.

Thus, Reeds expressly acknowledges that reaction forces are transmitted throughout the system.

In view of the foregoing, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.